

Characteristics of Maxillofacial Fractures Resulting from Road Traffic Accidents at Dr. Hasan Sadikin General Hospital

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Abstract

Background: Maxillofacial fracture is a serious injury in the head region which is frequently found in the emergency room. In Indonesia, the road traffic accident is the main etiology. Epidemiological assessments are important to assess trends and set the priorities for treatment and prevention of the injury. This study was conducted to identify the characteristics of maxillofacial fracture resulting from road traffic accidents.

Methods: This descriptive retrospective study involved hospitalized patients with maxillofacial fracture resulting from road traffic accidents at Dr. Hasan Sadikin General Hospital in 2011–2013 using the total sampling technique. Data were collected in the period August–October 2014 which included patient demographics, detailed description of the accident and the fracture.

Results: A total of 187 patients with male/female ratio of 5:1 and a mean age of 26.78 year. The majority of patients were motorcyclists (92%) with most of them were not wearing safety equipment. Most of the accidents took place in 2011 in Bandung. Mandible was the most common site of injury followed by the maxilla and nasal bone. Open reduction was performed in 69.52% patients).

Conclusions: Maxillofacial fracture is more common in men with the mean age of 26.78 years. The majority of patients are motorcyclists. Most of them are not using safety equipment. Most of the accidents occurred in Bandung in 2011. Mandible is the most common site of fracture. Open reduction is the most commonly performed treatment.

Keywords: Head injury, maxillofacial fracture, road traffic accident.

Introduction

Maxillofacial fracture is a serious injury in the head region which is frequently found in the emergency room.¹ The maxillofacial region is more vulnerable to fractures because it is the most exposed part of the body.¹ Besides Maxillofacial fracture still becomes a serious clinical problem because of its specific anatomical area, where the important organs such as respiratory, neurologic, and digestive system are located.² A study in Uganda² stated that 20% of maxillofacial fracture patients have cranio-cerebral injury. It also can affect the patient's quality of life, such as the psychological and esthetical aspect.² The etiology of maxillofacial fractures are road traffic accident, assault, fall, sport injury,

domestic violence, and other.^{1,3,4} In developing countries, road traffic accident is still the main etiologic factor of maxillofacial fractures. In Indonesia⁵ especially West Java, 84.2% cases of maxillofacial fracture are caused by road traffic accidents.

A road traffic accident is caused by many factors. Human factor is one of the main reasons for traffic accidents. Driving while sleepy, fatigue, at inappropriate speed, or without using protective gears (such as helmet and safety belts) and poor compliance to traffic laws are examples of human factors contributing to road traffic accidents. The development of roads and other transport infrastructures which did not keep up with the rapid pace of increase in the number of vehicles also contributes to road traffic accidents.⁶

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Epidemiological assessments are important to assess trends and set the priorities of treatment protocols and prevention programs against the injury.⁷ The aim of this study was to identify the frequency and characteristics of patients with maxillofacial fractures resulting from road traffic accidents at Dr. Hasan Sadikin General Hospital.

Methods

Population of the study were patients with maxillofacial fractures resulting from road traffic accidents at Dr. Hasan Sadikin General Hospital. The subjects of the study were hospitalized patients with maxillofacial fractures resulting from road traffic accidents at Dr. Hasan Sadikin General Hospital in the period 2011–2013. The inclusion criteria were hospitalized patients with maxillofacial fractures resulting from road traffic accidents at Dr. Hasan Sadikin General Hospital in the period 2011–2013. This study excluded patients whose detailed data were not completed in the medical record such as identity, type of fracture and the treatment. This study used total sampling as data collection method.

This descriptive retrospective study was using the cross-sectional method. This study was conducted by using data in medical records of hospitalized patients with maxillofacial fractures resulting from road traffic accidents treated in Otorhinolaryngology-Head and Neck Surgery Department, Oral and Maxillofacial Surgery Department, Plastic Surgery Department and Neurosurgery Department at Dr. Hasan Sadikin General Hospital in the period 2011–2013. Data were collected between August and October 2014. This study was approved by the Health Research Ethics Committee Faculty of Medicine Universitas Padjadjaran and Dr. Hasan Sadikin General Hospital, Bandung.

The collected data included patient's identification and demographic features, detailed description of the accident (time and location of accident, role of patient in vehicle, the vehicle and safety equipment used), detailed description of the injury (type of fracture, treatment of the fracture and location of concomitant injury).

Information of patient identification and demographic features were obtained from the identity form of the patient's medical record. Detailed data descriptions of the accident were obtained from the anamnesis written in the medical record. While data regarding

the detailed description of the injury (type of fracture and location of concomitant injury) were obtained from the anamnesis, physical examination, and supportive examination written in the medical record. Data concerning the treatment of the patient were collected from the information written in the medical record.

The etiology of maxillofacial fractures was grouped into road traffic accidents and other causes. The time of accidents were grouped into year 2011, 2012 and 2013. The locations of accidents were grouped into Bandung and outside Bandung region. Bandung region included Bandung city, Kabupaten Bandung and Kabupaten Bandung Barat (Regencies), other than that was outside Bandung region. The type of vehicles used by patients were grouped into pedicab, bus, car, bicycle, motorcycle, and truck. Patients who did not have a description about the location of accident and type of vehicle were included into the no-details group. The roles of patient who used vehicles were grouped into driver and passenger. The safety equipments used by the patient at the time of accident were classified into using the safety equipment, were not using the safety equipment and have no-details group.

The injuries which patients suffered were grouped into maxillary fracture, mandible fracture, nasal fracture, orbital fracture, frontal sinus fracture, zygoma fracture, and multiple maxillofacial fractures. The mandibular fractures were grouped by their anatomical location into angular, condyle, coronoid, corpus, parasymphysis, ramus, symphysis, and subcondyle. The maxilla fractures were grouped into unilateral fracture and Le Fort classification. In addition patients having a combination of more than one type of isolated maxillofacial fractures were grouped into multiple maxillofacial fractures. The treatment of fractures were classified into open reduction, closed reduction, conservation, and refused treatment.

All data obtained were input using the Microsoft Excel 2007 program. The data analysis was conducted using descriptive statistics, while statistical software was used for statistical analysis.

Results

The total data obtained in this study was 368, but only 211 cases with maxillofacial fractures were treated at Dr. Hasan Sadikin General Hospital Bandung, in the period January 2011

Table 1 Demographic Characteristics of Maxillofacial Fracture

Characteristics	Frequency	Percentage (%)
Etiology	211	
Road Traffic Accident	187	88.63
Other	24	11.37
Sex	187	
Male	156	83.4
Female	31	16.6
Age		
Mean+SD = 26.78+11.64years		
Median = 24 years		
Mode = 17 years		
Range = 5–70 years		
Time of accident	187	
2011	88	47.1
2012	55	29.4
2013	44	23.5
Location of accident	187	
Bandung region	110	58.8
Outside Bandung region	72	38.5
No details	5	2.7
Type of vehicle used	187	
Pedicab	0	0
Bus	2	1.1
Car	5	2.7
Bicycle	1	0.5
Motorcycle	172	92
Pedestrian	6	3.2
Truck	0	0
No details	1	0.5
Role of Patient	180	
Driver	158	92.94
Bicycle	1	
Bus	0	
Car	4	
Motorcycle	153	
Passenger	22	7.06
Bicycle	0	
Bus	2	
Car	1	
Motorcycle	19	

Table 2 Distribution of the Type of Vehicle and the Safety Equipment Used

Type of vehicle	Safety Equipment Used						Total
	Using		Not Using		No details		
	f	%	f	%	f	%	
Car	0	0	4	80	1	20	5
Motorcycle	84	48.8	81	47.1	7	4.1	172
Total	84	47.5	85	48	8	4.5	177

to December 2013. Out of the 211 cases, only 187 cases (88.63%) met the inclusion criteria and 24 cases (11.37%) resulted from other causes such as interpersonal violence, sport injury, work injury, falls, etc. There were 156 (83.4%) males and 31 (16.6%) females, causing a male to female ratio of approximately 5:1 and an age range from 5–70 years (mean = 26.78 years; SD = 11.64 years) (Table 1).

The distribution of patients with maxillofacial fractures resulting from traffic accidents according to the time of accident

revealed that most accidents occurred in 2011 (88 patients, 47.1%) and least in 2013 (44 patients, 23.5%). The distribution according to the location of the accidents revealed that most accidents occurred in Bandung region (110 patients, 58.8%).

Based on the statistics of patients with the type of vehicle used showed most of the patients were using a motorcycle at the time of the traffic accident, causing maxillofacial fractures (172 patients, 92%). While other patients were using car, bus, bicycle, or were

Table 3 Types of Maxillofacial Fracture

Type of Fracture	Frequency	Percentage (%)
Maxillary	21	11.2
Unilateral	7	33.3
Le Fort I	5	23.8
Le Fort II	7	33.3
Le Fort III	2	9.5
Mandibular*	89	47.6
Angular	20	16.95
Condyle	11	9.32
Coronoid	1	0.85
Corpus	17	14.41
Parasymphysis	48	40.68
Ramus	2	1.7
Symphysis	15	12.71
Subcondyle	4	3.39
Nasal Bone	15	8
Orbital	4	2.1
Frontal Sinus	4	2.1
Zygoma	8	4.3
Multiple Fracture	46	24.6
Total	187	100

Note: * More than one type can be present for each patient

Table 4 Distribution of Multiple Maxillofacial Fractures

Type of Fracture*	Frequency
Maxillary	24
Unilateral	11
Le Fort I	3
Le Fort II	9
Le Fort III	6
Mandibular	25
Angular	1
Condyle	4
Coronoid	0
Corpus	3
Parasymphysis	13
Ramus	1
Symphysis	6
Subcondyle	1
Nasal Bone	20
Orbital	16
Frontal	12
Zygoma	20

Note: * More than one type can be present for each patient

pedestrians.

Furthermore, the statistics of patients with reference to their role in using a vehicle revealed that the majority of patients were motorcycle drivers (153 patients), followed by motorcycle passengers (19 patients), and car drivers (4 patients) (Table 1).

The distribution of type of vehicle according to the safety equipment used by maxillofacial fracture patients revealed, most of the patients who used a motorcycle at the time of accident were not wearing safety equipment (85 patients, 48%). There were no data available in the patient's medical record regarding the safety equipment worn by patients who were using a bicycle and bus (Table 2).

The distribution of patients with maxillofacial fracture resulting from road traffic accidents according to the type of fracture showed that the multiple maxillofacial fracture is the combination of more than one type of isolated maxillofacial fractures. The most common site of fractures were mandible (89 patients-47.6%), maxilla (21 patients-11.2%), and nasal (15 patients-8%) (Table 3).

The distribution of the type of maxillofacial

fracture in multiple maxillofacial fracture patients revealed that the common sites of fractures were mandible, maxilla, nasal and zygoma (Table 4).

The statistics of patients in relation to the treatment of maxillofacial fractures showed that open reduction was performed in 69.52% of patients, while 10.6% of patients had close reduction (Table 5).

Discussion

In this study, road traffic accident was the main etiology of maxillofacial fractures compared to other factors. This result was in accordance with the study conducted by Adeyemo et al.¹ in Nigeria and Leles et al.⁷ in Brazil which showed most patients with maxillofacial fractures resulted from road traffic accidents, however it was inconsistent with a similar study conducted by Pham-Dang et al.⁴ in France that showed interpersonal violence as the main cause of maxillofacial fracture. The study conducted in Azerbaijan⁸ stated that the road traffic accident is still the main reason for maxillofacial fractures, due to the rapid increase in the number and type of vehicle and

Table 5 Distribution of Treatment of Fractures

Characteristics	Frequency	Percentage (%)
Concomitant Injury	187	
Upper Extremity Injury	4	2.1
Lower Extremity Injury	6	3.2
Ocular Injury	1	0.5
Mild Head Injury	59	31.6
Moderate Head Injury	7	3.7
Severe Head Injury	0	0
Thorax Injury	3	1.6
Abdominal Injury	0	0
Multiple Injury	7	3.7
Without Injury	100	53.5
Treatment of Fracture	187	
Open Reduction	130	69.52
Close Reduction	20	10.7
Conservative	7	3.74
Refuse Treatment	30	16.04

along with poor driver's compliance with the traffic law.

This study exhibited that most of the patients were males. More males were involved in maxillofacial fractures than females which were in accordance with other previous international studies.^{3,7,9,10} The predominance of male patients could be due to the fact that males are the breadwinner of the family and mostly work outdoors, consequently have a high risk to road traffic accidents. Even though in past decades, there is an increase in the prevalence of female patients especially of those aged below 40 years due to changes in their social behavior, for example their participation in non-domestic work. Cultural and socioeconomic factors of certain regions determine the prevalence of male to female ratio of maxillofacial fracture patients.⁷ In countries where women are extensively active in social activities such as in Brazil⁷, the male to female ratio is 3:1. On the other hand, in the United Arab Emirates¹⁰ the male to female ratio is 7:1, due to the fact that mostly men are working outdoors and few women are driving vehicles.

The mean age of the subjects in this study was 26.78 year with most cases below the age of 24 years. These results are consistent with the study conducted by Leles et al.⁷ in the Brazil which showed that 32.3% of the

patients are in the age group of 21–30 years. Other international studies also had similar results with this study. This was possibly due to their behavioral changes into independent individuals, high mobility, careless driving on the roads and economically active segment of society. On the other hand, in this age group, their compliance to the traffic law is poor and their inexperience in driving.^{1,2,7,9-11}

The frequency of maxillofacial fracture resulting from road traffic accidents in this study steadily decreased from year to year. Whilst a study conducted in Kenya¹¹ had similar results. There is a decrease in the number of maxillofacial trauma resulting from road traffic accidents in 2004 compared to 2003. It might be due to an increase of awareness among the road users about the importance of compliance to the traffic law including wearing safety equipment while driving.

According to the location of the traffic accident, more traffic accidents occurred in Bandung region than outside Bandung region. Nevertheless, there was no other study concerning the location of road traffic accidents which caused maxillofacial fractures in West Java.

Our results demonstrated that the maxillofacial fractures resulting from traffic accidents were most common in the group of patients who were using motorcycle as their

vehicle when the accident occurred. Based on the role of the patients with vehicles, most of the subjects were motorcycle drivers followed by motorcycle passengers and next, car drivers. It is in accordance with the study conducted by Leles et al.⁷ in Brazil which showed 41.32% of patients are motorcyclist. It can be explained by the fact that in Indonesia, the prevalent number of people is using a motorcycle as means of transport. It was proven by data from Statistic Indonesia (Badan Pusat Statistik, BPS) that showed in 2012 motorcycle is the most common used vehicle in Indonesia.¹³ It occupied 80.95% of all vehicle transport in Indonesia; however, this result was different with the study conducted by Akama et al.¹¹ in Kenya that showed most of the subjects are 72.5% pedestrians.

Furthermore, most of the maxillofacial fracture patients in this study were not wearing safety equipment such as safety belts and helmets. However the number was not significantly different with the subjects who were wearing safety equipment, indicating that the compliance of road users for wearing safety equipment was still low. This study result is lower than another study result in Malaysia¹², which reported 60% of motorcyclist are wearing helmets. However, it is higher than in the study conducted by Oginni et al.¹⁴ which showed only 3% patients are wearing helmets.

The application of safety equipment by the vehicle users was important. Data showed that there was a significant decrease in the occurrence of road traffic accidents in developed countries after the enforcement of the traffic law. The best protection against injuries as indicated by vehicle accident statistics includes safety awareness and a personal commitment to ride safely all the time. Another study showed that the usage of safety belts can reduce 42% of fatalities, while the motorcyclist who are not wearing helmets are five times more likely to have severe head injury.^{7,11}

In this study, mandible fracture was the most common type of maxillofacial fracture. This agrees with the result of a study from Al Khateeb¹⁰ in United Arab Emirates (UAE). The locations of mandible fractures in this study were more common in the parasymphysis and corpus region. The study conducted by Leles et al.⁷ in Brazil revealed that the most common affected region was condyle of the mandible. The tendency is due to the prominence of mandible and is the only movable bone in the maxillofacial region.⁹ Whilst a different study revealed that the most affected region

of maxillofacial fractures are nasal and zygomatic-orbital complex.⁷

This study showed that more patients received open reduction as their fracture treatment than others, which was also reported elsewhere.⁴ Contrary, this study results was different with the study conducted by Adriane² in Uganda which showed that most of the fracture patients are performed by closed reduction. In Uganda², it is due to the cost of open reduction and the scarce of plates and theater space to perform the procedure.

This study concluded that maxillofacial fractures resulting from road traffic accidents are more common in male than in female patients. The mean age of the patient is 26.78 years. The highest prevalence of fracture occurs in the Bandung region, in 2011. The majority of patients are motorcycle drivers, followed by motorcycle passengers, pedestrians, car drivers, and car passengers, respectively and most of them are not wearing protective equipment. The frequent type of maxillofacial fracture resulting from road traffic accidents includes mandibular fracture, maxillary fracture, and nasal bone fracture. Open reductions are more frequently performed than close reductions or conservative methods.

The limitations of study are mainly caused by the high number of incomplete data on the patient medical records regarding to the variable seek in this study. Improvements of the medical record system including the registry and storage system are highly recommended.

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